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Monitoring and Assessment of Aquatic Life in the Kaskaskia River for Evaluating IDNR Private Lands Programs: Annual Report 2019

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Annual Summary Report

Project Title:

Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs: Phase III

Project Number: RCREP18006

Contractor Information:

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Reporting Period: January 1, 2019- December 31, 2019

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Project Objectives:

(1) Continue established monitoring program that provides a basin-wide assessment of status and trends for aquatic life in wadeable streams associated with varying percentages of the watershed area enrolled to Conservation Reserve Enhanced Program (CREP) (i.e., CREP rate) in the Kaskaskia River Basin; (2) conduct targeted surveys in reaches with less-disturbed watersheds to improve coverage along the gradient of CREP rate within the basin; (3) continue monitoring of key fish populations within the Kaskaskia River; (4) continue monitoring of paired streams associated with different CREP rate; (5) engage in collaborative effort with IDNR to identify watersheds for suitable for land-use manipulation; (6) provide technical support for IDNR's Private Lands Programs.

Project Title: Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs: Phase III (Progress Report for 1/1/2019-12/31/2019)

Project Objectives:

(1) Continue established monitoring program that provides a basin-wide assessment of status and trends for aquatic life in wadeable streams associated with varying percentages of the watershed area enrolled to Conservation Reserve Enhanced Program (CREP) (i.e., CREP rate) in the Kaskaskia River Basin; (2) conduct targeted surveys in reaches with less-disturbed watersheds to improve coverage along the gradient of CREP rate within the basin; (3) continue monitoring of key fish populations within the Kaskaskia River; (4) continue monitoring of paired streams associated with different CREP rate; (5) engage in collaborative effort with IDNR to identify watersheds for suitable for land-use manipulation; (6) provide technical support for IDNR's Private Lands Programs.

Background:

Summary of Work in Phase I (2013-2015)

A full account of the work completed in Phase I of this project can be seen in Metzke and Hinz (2017). The primary objectives of Phase I focused on establishing a basin-wide assessment of status and trends of aquatic life in wadeable stream reaches, surveys in targeted stream segments which contain species with conservation status (*i.e.* focal reaches), and surveys at established Illinois State Water Survey CREP reaches (*i.e.* fixed site monitoring). In addition to the primary objectives the project supported two graduate student research projects investigating the relationships between CRP density and aquatic assemblages for fish assemblages and macroinvertebrate assemblages, respectively. A total of 144 reaches were surveyed in Phase I.

Summary of Work in Phase II (2016-2017)

The aim of Phase II was to continue monitoring and assessing aquatic life in the Kaskaskia Basin while expanding on the goals of the first phase of the project (Metzke et al. 2017). The primary objectives of Phase II focused on continuing basin-wide assessment of status and trends of aquatic life in wadeable stream reaches, expand sampling efforts of focal stream reaches, and conduct additional monitoring of key populations in the basin. Key aquatic populations included adult aquatic insects, mussels, and fish species sensitive to sedimentation. During the reporting period of 2017 the total number of reaches over the five survey season (including Phase I and II) was 240 reaches (Metzke et al. 2019).

Summary of Work Completed During Reporting Period (1/1/2019-12/31/2019):

Throughout the reporting period, efforts have continued to assess aquatic life in the Kaskaskia River Basin. In 2019, 39 wadeable stream sites were sampled during base-flow conditions to evaluate fish assemblages, benthic macroinvertebrate assemblages, stream habitat, and water chemistry throughout the basin (Figure 1). Consistent with previous monitoring methods, the length of each sampling site was established based on a length of 20-times mean wetted width (minimum 100m, maximum 300m). The 39 sites chosen for surveys fell into one of three categories (20 basin-wide sites, 16 sensitive species sites, and 4 less-disturbed sites) that correspond with three of the project objectives. With the addition of the 2019 sites, a combined total of 319 streams monitoring surveys have been conducted in the Kaskaskia River Basin since the onset of the monitoring program (Figure 2).

Fish community sampling using a single-pass electrofishing technique (e-seine or backpack) was conducted at each of the 39 monitoring sites. At all sites, fish were identified to species and length, weight, & condition were collected for at least the first 30 individuals of each species before releasing them back to the stream.

Benthic macroinvertebrate sampling was conducted at each of the 39 sites using a standard multihabitat, 20-jab sampling approach (Barbour et al. 1999, ILEPA 2011). Habitats for macroinvertebrate sampling were determined by the relative ratio of in-stream habitat within the established sampling site. The 2019 benthic macroinvertebrate samples are currently being sorted for a 300-organism fixed-count subsample to be sent to a certified external lab for taxonomic identification. EcoAnalysts, Inc. have been contacted to conduct the identification work for comparability to samples of the previous phases of the project.

Habitat assessments were conducted at each site during the 2019 sampling season using the Qualitative Habitat Evaluation Index (QHEI; Ohio EPA 2006) and the Illinois Habitat Index (IHI; Sass et al. 2010). The QHEI was developed by the Ohio EPA to provide a qualitative assessment of the habitat characteristics that are important for supporting fish communities. The IHI was developed to provide a qualitative evaluation of physical habitat and the response to human degradation in upstream and local watershed, while also taking into account regional differences throughout Illinois. The combination of the QHEI and IHI assessments aids our understanding of the habitats available to aquatic life and how those habitats are changing through time.

Water chemistry parameters (dissolved oxygen, specific conductance, turbidity, pH, nitrate nitrogen, total reactive phosphorus, ammonia nitrogen, and temperature) were measured during base flow conditions at each of the 39 sites. These parameters were collected through a combination of Hach field test kits and a handheld water quality meter (Hach HQ 20d). Stream discharge was measured at 35 of the 39 sites, where water depth and flow conditions were appropriate for the threshold of our flowmeter. In addition to water chemistry grab sampling, 36 water temperature loggers were deployed for continuous temperature sampling in select basin-wide (n=20), sensitive species reaches (n=14), and less disturbed sampling sites (n=2). Temperature loggers will be retrieved in 2020 and the recorded data will be used to assess mean thermal regimes.

Objective 1- Basin-wide Assessment

To evaluate the current physical, chemical, and biological status of streams in the Kaskaskia River Basin stream segments were selected using a stratified random sampling technique (stream size and sub-basin as strata). Stream size was given two strata levels based on link number: small (link ≤10) and large (link ≥ 11). Five stream segments (three small and two large) were randomly chosen in each of the four United States Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) scale sub-basins of the Kaskaskia River Basin. One sampling site was established in each of the selected stream segments based on a length of 20-times mean wetted width (minimum 100m, maximum 300m). During the 2019 sampling season, these 20 basin-wide sites were surveyed for fish, benthic macroinvertebrates, habitat, and water chemistry parameters (Figure 1).

Objective 2- Less-disturbed Watersheds

To improve our understanding of the gradient of land-use within Kaskaskia River Basin, stream segments were selected with high (>50%) less-disturbed land use types for total upstream watershed. Land-use data from Great Lakes Regional Aquatic Gap Project (Holtrop et al. 2005) was used to compile a list of target stream segments in which total upstream watershed had 50% or more less-disturbed land use types. Less-disturbed land types includes all lands types that are not considered urban or agricultural (*e.g.* grassland, forest, etc.). A total of four less-disturbed sites were sampled within base-flow conditions of the reporting period (Figure 1). These four less-disturbed sites were surveyed for fish, benthic macroinvertebrates, habitat, discharge, and water chemistry parameters with the same methods as the basin-wide sampling sites.

Objective 3- Monitoring of Focal Fish Populations

Fifteen locations with fish species considered to be sensitive to fine sediment were identified and sampled during Phase II (Metzke et al. 2017). Monitoring at these fifteen sensitive species sites continued during the 2019 sampling season with the full suite of data collection: fish, benthic macroinvertebrates, habitat, discharge, and water chemistry parameters (Figure 1). In addition, fish length, weight, and condition data was collected for the first 30 individuals of each species at each of the stream sites visited in 2019 including the basin-wide, sensitive species, and less-disturbed sites. This expands the monitoring programs efforts from the eleven target species identified and sampled in Phase II to all species per sampling site. Length and weight relationships are frequently used as an estimate of fish condition (Bolger and Connolly 1989). These data collection efforts are intended to expand our understanding of the variation of fish condition throughout the basin to include a wider variety of species and basin locations.

Objective 4- Continue monitoring of paired streams associated with different CREP rate.

To continue monitoring paired streams that have variant local watershed CREP rates the 8 pairs of reaches originally selected in Phase II (Metzke et al. 2017) were revisited in 2018. Surveys to collect fish, benthic macroinvertebrate, habitat, and water chemistry data were conducted at 15 of the 16 total sites. The single site at which full surveys were not conducted had a dry stream bed during the sampling season therefore only partial habitat data could be collected. Combined with data from previous years, the paired sites data give us a good

opportunity to investigate the temporal variation and trends among and between paired sites of the Kaskaskia River Basin. During the 2019 reporting period, no additional sampling of paired stream sites was conducted in order to give priority to sampling sensitive species sites.

Objective 5- Engage in collaborative effort with IDNR to identify watersheds for suitable for land-use manipulation.

During the reporting period we have identified that more information about conservation practices in the Kaskaskia River Basin beyond CRP and CREP need to be understood and accounted for while investigating potential watersheds for manipulation. There are many alternative programs available in the state of Illinois including but not limited to the Conservation Stewardship Program (CSP), Environmental Quality Incentives Program (EQIP). Agricultural Conservation Easement Program/Wetlands Reserve Program, Illinois Conservation Practices Program (CPP), and Illinois Headwaters Invasive Plant Partnership (HIPP). The more that is known about adoption of these alternative conservation practices in the Kaskaskia River Basin the better we will understand the interactions between conservation practices as a whole and the effects on aquatic life. If we want the land-use manipulation study to have the best opportunity to see an effect on aquatic life a complete picture of potential drivers of change in aquatic life is necessary.

Objective 6- Provide technical support for IDNR's Private Lands Programs.

The Technical Support component of this project is designed to assist with the identification of critically necessary conservation easements and site design for practice information statewide, and to interpret mapping information and identify priority areas for permanent easement acquisition by the Department of Natural Resources' (IDNR) Division of Private Lands and Watersheds (PLW) and partnering programs (Federal and State Conservation Programs). We provide work products that allow for rapid access to geospatial information and assessments of physical site characteristics such as soils, landcover, topography, and hydrologic information to identify sites to be restored and protected through easement or acquisition. Private land program databases were updated and integrated with new data to be used for CREP core activities. Farm Service Agency Conservation Priority Areas and Illinois Wildlife Action Plan Focal Areas were used to identify priority areas for CREP actions. Data were provided to the IEPA to facilitate analyses within the Illinois Nutrient Loss Reduction Strategy.

Reporting:

A summary of the ongoing work of the monitoring project will be presented at the 2020 Midwest Fish and Wildlife Conference. (Hostert et al. 2020, Poster Title: "Monitoring the response of wadeable stream communities to the Conservation Reserve Enhancement Program in the Kaskaskia River Basin"). Preparations of a manuscript based on the thesis of a graduate student, Levi Drake, is planned.

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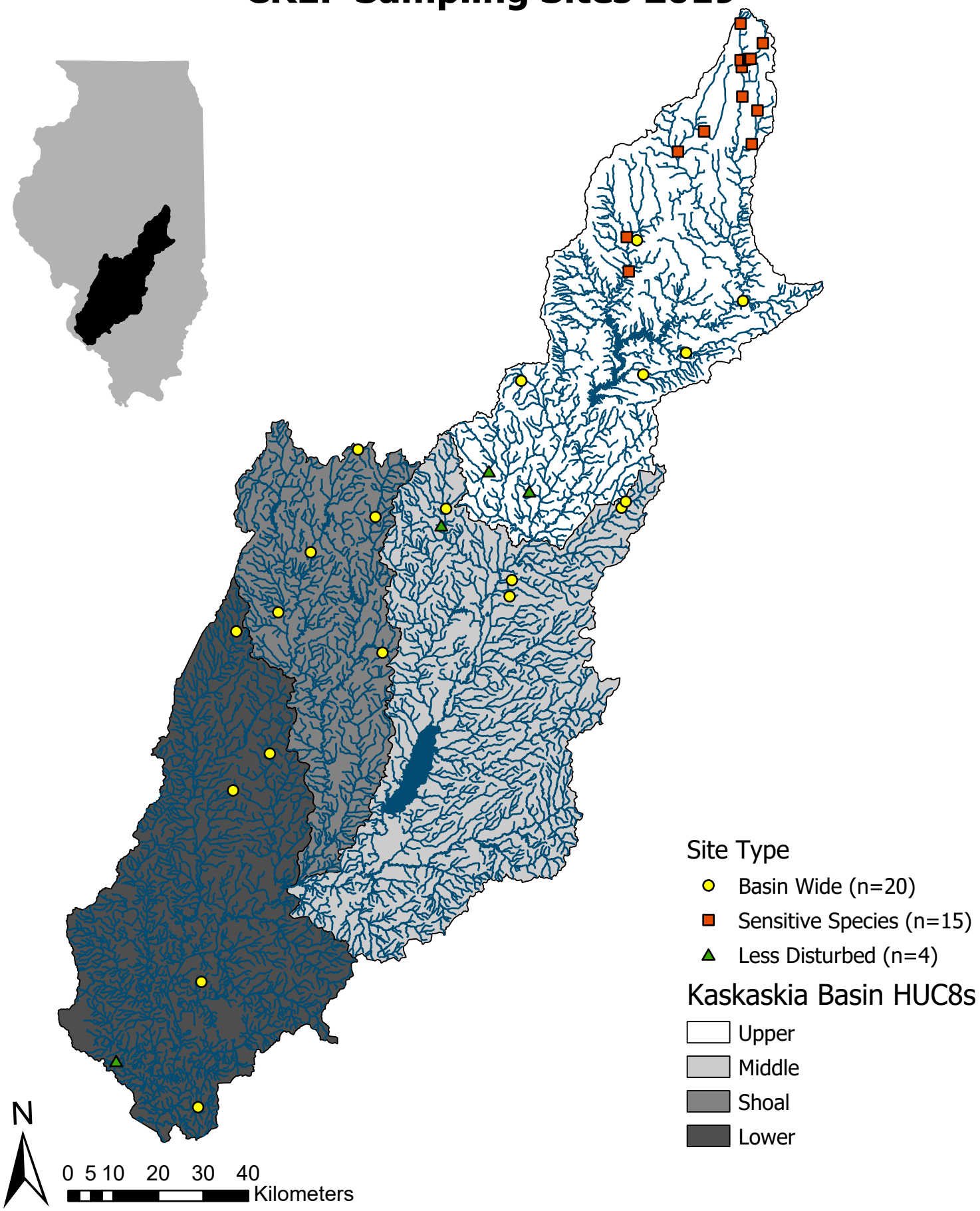

Figure 1. Locations of 39 wadeable stream sites in the Kaskaskia River Basin of Illinois sampled in 2019. The basin is broken down to four United States Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) scale sub-basins (Upper, Middle, Shoal, & Lower). Site types included basin-wide sites (yellow circle, n=20), sensitive species (orange square, n=15), and less disturbed (green triangle, n=4).

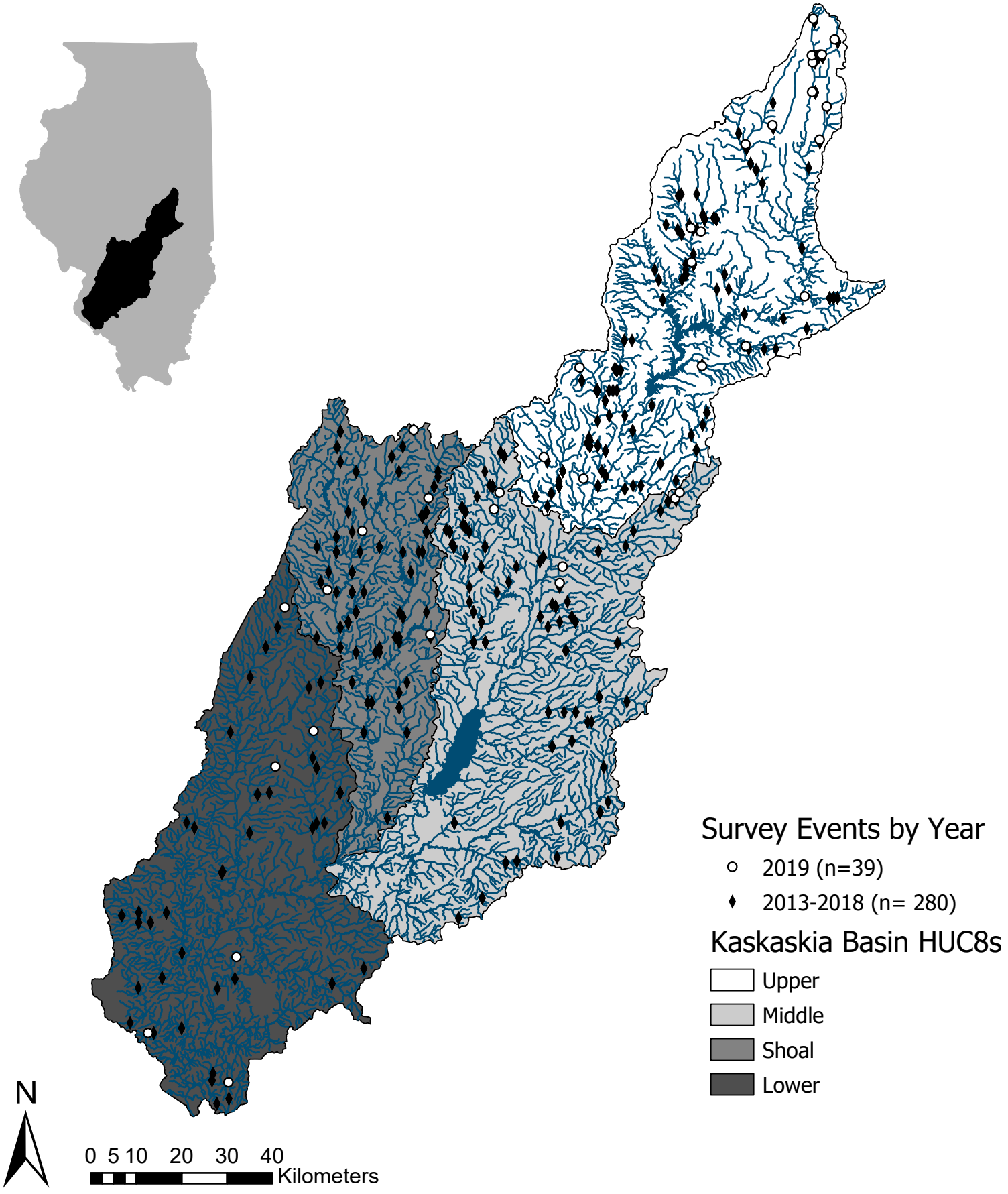

Figure 2. Locations of wadeable stream survey sites in the Kaskaskia River Basin of Illinois sampled to monitor and assess aquatic life. Sampling locations from 2013-2018 (black diamonds, n=280) and 2019 (white circles n=39). The basin is broken down to four United States Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) scale sub-basins Upper, Middle, Shoal, & Lower).